WHAT IS CLAIMED IS:

1. A control unit comprising:

a module configuration information storing portion for storing starting procedure of at least one software module composing an application program; and

a module starting control portion for executing said application program modules referring to said module configuration information storing portion.

2. A control unit according to claim 1, wherein said module configuration information storing portion stores an application program module being executed now and an application program module to be executed next by relating the modules with each other.

3. A control system having a plurality of control units connected to a network, where in said control unit comprises:

a module configuration information storing portion for storing starting procedure of at least one software module composing an application program; and

a module starting control portion for executing said application program modules referring to said module configuration information storing portion.

4. A control system according to claim 3, wherein said module configuration information storing portion stores an

application program module being executed now and an application program module to be executed next by relating the modules with each other.

5 5. A distributed control system comprising a network and at least one control unit having a communication means for connecting to said network, wherein said control unit comprises:

a message object configuration information storing

10 means for storing a starting procedure of at least one message object having a network communication function; and

a real-time communication processing control means for executing said message object by referring to said message object configuration information storing means.

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6. A distributed control system according to claim 5, wherein said real-time communication processing control means is a software module executed by a task.

20 7. A distributed control system according to claim 5, wherein said message object configuration information storing means comprises a communication processing priority indicating a priority to execute communication processing, and executes the communication processing based on the

25 priority.

8. A distributed control system according to claim 7,

wherein said message object configuration information storing means comprises information indicating any one of in-unit communication and inter-unit communication; and said communication processing priority in regard to the

5   inter-unit communication.

9.   A distributed control system according to claim 5, wherein said message object configuration information storing means comprises kinds of communication services.

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10.   A distributed control system comprising at least one control unit connected to a network, wherein said control unit comprises:

a module configuration information storing means for

15   storing starting procedure of at least one software module composing an application program;

an object configuration information storing means for storing starting procedure of at least one message object having a network communication function;

20   a module start control means for executing said application program module referring to said application program module configuration information storing means; and

a real-time communication processing control means for executing said message object referring to said message

25   object configuration information storing means.

11.   A distributed control system according to claim 10,

wherein said module start control means is a task.

12.   A distributed control system according to claim 10, wherein said module start control means is one of functions

5   in an OS.

13.   A distributed control system according to claim 10, wherein said application program module configuration information storing means includes a software module

10   information to be executed next. ⸺ ?

14.   A distributed control system according to claim 10, wherein said real-time communication processing control means is a software module executed in a task.

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15.   A distributed control system according to claim 10, wherein said real-time communication processing control means is a task.

20   16.   A distributed control system according to claim 10, wherein said real-time communication processing control means is one of functions in an OS.

17.   A distributed control system according to claim 10,

25   wherein said message object configuration information storing means includes a communication processing priority.

18. A distributed control system according to claim 10, wherein said message object configuration information storing means includes information indicating whether a message object is in-unit communication or inter-unit communication.

19. A distributed control system according to claim 10, wherein said message object configuration information storing means includes kinds of communication services.

20. A distributed control system according to claim 10, wherein said message object configuration information storing means includes software module information to be executed next.

21. A control system comprising a module configuration information string means for storing a starting means for at least one software module composing an application program; an object configuration information storing means for storing a starting procedure of at least one message object having a network communication function; at least one control unit having a module start control means for executing said application program module referring to said module configuration information storing means and a real-time communication processing means for executing said message object referring to said object configuration information storing means; a computer having information to

be stored in said module configuration information storing

means; and an initializing means for storing said

information in said module configuration information

storing means, said initializing means existing in said

5   control unit, wherein all the means and the computer are

connected to a network.

22.)   A distributed control middleware code generating tool

which receives system configuration information and outputs

10   a program code composed of information to be stored in said

application program module configuration information

storing means and said module starting control means.

23.   A distributed control system executing application

15   through message communication processing between

application programs on a plurality of control units,

wherein

each of said control units comprises:

a first information storing means for storing said

20   application programs and a communication control processing

program in which said message communication processing is

defined;

a second information storing means for storing module

configuration information in which starting order of the

25   programs on said control unit is determined; and

a third information storing means for storing message

object by which a start control means for starting said

application program and said communication processing program and a communication control program started by said start control means send and receive message data between said application programs based on the starting order

5 determined in said module configuration information.

24. A distributed control system according to claim 23, wherein

said start control means comprises a plurality of

10 tasks starting at least one program based on the starting order determined in said module configuration information, and

order of starting the programs by each of said tasks is individually determined in said module configuration

15 information.

25. A distributed control system according to claim 23, wherein

said message object further has priority information,

20 and

a message sending and receiving by the communication control program started by said start control means is executed according to the priority information of said message object.

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26. An information processing system comprising:

an input receiving means for receiving inputs of

starting order information of all application modules comprising an application executed on a distributed control system having a plurality of control units, unit storing information designating a unit allocated to each of said

5 application modules and input data name information of each of said application modules;

an information generating means for generating at least one of module configuration information and message object based on said starting order information and said

10 input and output data name information, wherein in regard to each of the control units designated as the allocated units by said allocation unit information, said module configuration information determines starting order on said control unit of all the application modules allocated to

15 said control unit and said message object is for sending and receiving each of the application modules allocated to said control unit; and

an output means for outputting the information generated by said information generating means.

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27. An information processing system according to claim 26, wherein

said input receiving means further receives an input of executing priority information expressing an executing

25 priority of each of the application programs composing said application,

said module configuration information of each of the

control units generated by said information generating means further includes the executing priority information expressing the executing priority of each of the application programs composing said application allocated

5   to said control unit, and

said information generating means generates executing priority information of each application module allocated to each of said control units based on the executing priority of said application module of which the input is

10   received by said input receiving means.

28.   An information processing system according to claim 27, wherein

the message object generated by said information

15   generating means further includes priority information, and

when there is one or a plurality of application programs reading messages out of said message object in each of said message object, said information generating means generates priority information based on executing

20   priority information of an application program of an executing priority of said one application or an application program having the highest executing priority among said plurality of application programs, and

when there is no application program reading messages

25   out of said message object, said information generating means generates priority information of said message object based on the executing priority of an application program

writing a message in said message object.

29.   An information processing system according to claim 26, wherein

5   said module configuration information of each of said control units generated by said information generating means further includes starting condition information of each task for starting on the said control unit at least one program which is allocated to said control unit, and

10   said information generating means determines, for each of said control units, an output timing of a message received by an application program started first in each task on said control unit based on said system configuration information and said input and output data

15   name information, and generates said starting condition information of each task based on said output timing.

30.   An information processing system according to claim 26, wherein

20   said information generating means determines a message data sent and received between application programs allocated to a single control unit based on said allocation unit information and said input data name information, and in regard to said message data any message object for

25   sending and receiving said message data is not generated.

31.   A memory medium capable of being mechanically read,

which stores at least one of module configuration information and message object, said module configuration information determining, for each control unit on a distributed control system, starting order on a control

5 unit of all the application programs allocated to the control unit, said message object being for sending and receiving each of the application modules allocated to said control unit.

10 32. A real-time distributed system comprising a network controller for performing network communication, a memory for storing a program and a CPU for executing the program stored in said memory, sending and receiving processing of a message having a communication priority is executed using

15 said network controller while the program stored in said memory is being executed by said CPU, which further comprises:

a network driver for performing network communication by executing processing of sending and receiving a

20 plurality of massages using said network controller containing a plurality of sent and received messages to be handled;

a network driver priority management portion for determining priorities on the processing of said network

25 driver corresponding to the priorities of communication of the sent and received messages; and

a scheduling portion for executing the processing of

said network driver according to the priorities of the processing of said network driver.

33.   A real-time distributed system comprising a network

5   controller for performing network communication, a memory for storing a program and a CPU for executing the program stored in said memory, sending and receiving processing of a message having a communication priority is executed using said network controller while the program stored in said

10 memory is being executed by said CPU, which further comprises:

a message memory portion for storing a plurality of sent and received messages;

a network driver for performing network communication

15 by executing processing of sending and receiving the plurality of messages stored in said message memory portion using said network controller;

a network driver priority management portion for determining priorities on the processing of said network

20 driver corresponding to the priorities of communication of the sent and received messages to be handled; and

a scheduling portion for executing the processing of said network driver according to the priorities of the processing of said network driver.

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34.   A real-time distributed system comprising a network controller for performing network communication, a memory

for storing a program and a CPU for executing the program stored in said memory, sending and receiving processing of a message having a communication priority is executed using said network controller while the program stored in said

5   memory is being executed by said CPU, which further comprises:

a message memory portion for storing a plurality of sent and received messages;

a network driver for performing network communication

10 using said network controller;

a communication processing library for executing processing of sending and receiving a plurality of messages stored in said message memory portion using said network driver;

15 a network driver priority management portion for determining priorities on the processing of said network driver corresponding to the priorities of communication of the sent and received messages to be handled; and

a scheduling portion for executing the processing of

20 said network driver according to the priorities of the processing of said network driver.

35.   A real-time distributed system according to claim 32, wherein said network controller comprises a plurality of

25 mail boxes, and executes network communication of the messages stored in said plurality of mail boxes corresponding to priorities of said messages.

36. A real-time distributed system according to claim 35, wherein each of said plurality of mail boxes stores messages of one priority.

37. A real-time distributed system according to claim 35, wherein each of said plurality of mail boxes stores messages of a plurality of priorities.

38. A real-time distributed system according to claim 32, wherein said network controller is a CAN controller processing CAN protocol, and said priority of communication is designated by a message ID of said message.

39. A real-time distributed system according to claim 32, wherein said network driver comprises a message sending task for executing message sending processing and a message receiving task for executing message receiving processing, and said scheduling portion executes said message sending task and said message receiving task according to priorities of processing of said network driver.

40. A real-time distributed system according to claim 33, wherein said message memory portion is a message object storing messages of OSEK-COM protocol.

41. A real-time distributed system according to claim 34,

wherein said network driver comprises a message buffer for temporarily storing a sent message or a received message, and the sent message or the message to be received is once stored in said message buffer and then stored in said

5   message memory portion.

42.   A real-time distributed system according to claim 35, wherein said network driver comprises message buffers for temporarily storing a sent message or a message to be

10   received, and a message stored in one of said mail boxes is stored in one of said message buffers.

43.   A real-time distributed system according to claim 35, wherein said network driver comprises message buffers for

15   temporarily storing a sent message or a message to be received, and messages stored in said plurality of mail boxes are stored in one of said message buffers.

44.   A real-time distributed system according to claim 34,

20   wherein said communication processing library executes message sending processing and message receiving processing according to OSEK-COM protocol.

45.   A real-time distributed system according to claim 44,

25   wherein said network driver includes a message sending task for executing message sending processing and a message receiving task for executing message receiving processing,

and executes said message sending task and said message receiving task according to the priority of processing of said network driver as a task other than the message sending processing and the message receiving processing of

5   said communication processing library.